The tests are cumulative and can include Pre-Calculus material mentioned in the MATH 2301 Calculus I handbook. This guide gives some sample questions for Sections 3.2, 3.3, 3.5, 3.6, and 3.7. In some cases part of the problem is deciding which method to use, so you may be able to do the problem using methods from earlier sections. Doing these problems does not replace doing homework problems.

1. (Pre-Calculus questions on finding inverses and manipulating logs and exponentials.)
2. Compute the following limits. If you use the Squeeze theorem or L'Hôpital's rule, then say so.
   (a) $\lim_{h\to 0} \dfrac{(3+h)^2 - 3^2}{h} =$
   (b) $\lim_{x\to\infty} \dfrac{2}{x}\sin(3x) =$
   (c) $\lim_{x\to\infty} \dfrac{2}{x}e^{3x} =$
   (d) $\lim_{x\to\infty} \dfrac{e^{3x}}{x^3} =$
   (e) $\lim_{x\to 1} \dfrac{\ln(x)}{\sin(\pi x)} =$
   (f) $\lim_{x\to\infty} \ln(5x^9) =$
   (g) $\lim_{x\to\infty} \arctan(e^x) =$
3. Compute the following derivatives:
   (a) $y = \dfrac{x^x \sin(2x)(x^5-7x)^6}{(\sqrt{x^9+1})3^x} \Rightarrow \dfrac{dy}{dx} =$
   (b) $f(x) = \tan(x) + \arctan(x) + \ln(x) + \log_4(x) + e^x \Rightarrow f'(x) =$
   (c) $f(x) = \big(x^4+2x\big)\big(\log_3(\arctan(7x))\big) \Rightarrow f'(x) =$
   (d) $f(x) = x^x(\sin(2x))^{\cos(3x)} \Rightarrow f'(x) =$
   (e) $f(x) = \tan(x) + 2\arctan(x) + 3\ln(x) + \log_4(x) + 5e^x \Rightarrow f'(x) =$
   (f) $f(x) = \sin(1) + 2^x + x^3 + x^{1/4} + 5 \Rightarrow f'(x) =$
   (g) $\dfrac{d}{dx}\left[\dfrac{\big(3x-\cos(x)\big)(x^2+2)}{x^4+5}\right] =$
   (h) $\dfrac{d}{dx}\left[\big((x^2+e^x)(x^3-4x^4)+7x\big)^9\right] =$
   (i) $f(x) = \sinh(\cosh(x)) \Rightarrow f'(x) =$
4. Prove that $\cosh(x+y) = \cosh(x)\cosh(y) + \sinh(x)\sinh(y)$.
5. For the function $f(x) = x^5 - x^3 + 2x$ find $(f^{-1})'(2)$.
6. Find an equation of the tangent line to the graph of $y = 3\arccos(x/2)$ at $(1, \pi)$.
7. A ladder 10 ft long is leaning against a vertical wall. It starts slipping, such that the bottom of the ladder slides away from the base of the wall at a speed of 2ft/s. Draw and label a diagram illustrating this scenario. How fast is the angle between the ladder and the wall changing when the bottom of the ladder is 6 ft from the base of the wall?